

## "The Astrophysics of Merging Black Holes"

When two supermassive black holes (SMBHs) approach within 1-10 mpc, gravitational wave (GW) losses begin to dominate the evolution of the binary, pushing the system to merge in a relatively small time. During this final inspiral regime, the system will emit copious energy in GWs, which should be directly detectable by pulsar timing arrays and space-based interferometers. At the same time, any gas or stars in the immediate vicinity of the merging SMBHs can get heated and produce bright electromagnetic (EM) counterparts to the GW signals. We present here a number of possible mechanisms by which simultaneous EM and GW signals will yield valuable new information about galaxy evolution, accretion disk dynamics, and fundamental physics in the most extreme gravitational fields.